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UNIT TERMINAL OBJECTIVE

- 4-4 At the completion of this unit, the paramedic student will be able to integrate pathophysiological principles and the assessment findings to formulate a field impression and implement the management plan for the patient with a burn injury.

COGNITIVE OBJECTIVES

At the completion of this unit, the paramedic student will be able to:

- 4-4.1 Describe the anatomy and physiology pertinent to burn injuries. (C-1)
- 4-4.2 Describe the epidemiology, including incidence, mortality/ morbidity, risk factors, and prevention strategies for the patient with a burn injury. (C-1)
- 4-4.3 Describe the pathophysiologic complications and systemic complications of a burn injury. (C-1)
- 4-4.4 Identify and describe types of burn injuries, including a thermal burn, an inhalation burn, a chemical burn, an electrical burn, and a radiation exposure. (C-1)
- 4-4.5 Identify and describe the depth classifications of burn injuries, including a superficial burn, a partial-thickness burn, a full-thickness burn, and other depth classifications described by local protocol. (C-1)
- 4-4.6 Identify and describe methods for determining body surface area percentage of a burn injury including the "rules of nines," the "rules of palms," and other methods described by local protocol. (C-1)
- 4-4.7 Identify and describe the severity of a burn including a minor burn, a moderate burn, a severe burn, and other severity classifications described by local protocol. (C-1)
- 4-4.8 Differentiate criteria for determining the severity of a burn injury between a pediatric patient and an adult patient. (C-3)
- 4-4.9 Describe special considerations for a pediatric patient with a burn injury. (C-1)
- 4-4.10 Discuss considerations which impact management and prognosis of the burn injured patient. (C-1)
- 4-4.11 Discuss mechanisms of burn injuries. (C-1)
- 4-4.12 Discuss conditions associated with burn injuries, including trauma, blast injuries, airway compromise, respiratory compromise, and child abuse. (C-1)
- 4-4.13 Describe the management of a burn injury, including airway and ventilation, circulation, pharmacological, non-pharmacological, transport considerations, psychological support/ communication strategies, and other management described by local protocol. (C-1)
- 4-4.14 Describe the epidemiology of a thermal burn injury. (C-1)
- 4-4.15 Describe the specific anatomy and physiology pertinent to a thermal burn injury. (C-1)
- 4-4.16 Describe the pathophysiology of a thermal burn injury. (C-1)
- 4-4.17 Identify and describe the depth classifications of a thermal burn injury. (C-1)
- 4-4.18 Identify and describe the severity of a thermal burn injury. (C-1)
- 4-4.19 Describe considerations which impact management and prognosis of the patient with a thermal burn injury. (C-1)
- 4-4.20 Discuss mechanisms of burn injury and conditions associated with a thermal burn injury. (C-1)
- 4-4.21 Describe the management of a thermal burn injury, including airway and ventilation, circulation, pharmacological, non-pharmacological, transport considerations, and psychological support/ communication strategies. (C-1)
- 4-4.22 Describe the epidemiology of an inhalation burn injury. (C-1)
- 4-4.23 Describe the specific anatomy and physiology pertinent to an inhalation burn injury. (C-1)
- 4-4.24 Describe the pathophysiology of an inhalation burn injury. (C-1)
- 4-4.25 Differentiate between supraglottic and infraglottic inhalation injuries. (C-3)
- 4-4.26 Identify and describe the depth classifications of an inhalation burn injury. (C-1)
- 4-4.27 Identify and describe the severity of an inhalation burn injury. (C-1)

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- 4-4.28 Describe considerations which impact management and prognosis of the patient with an inhalation burn injury. (C-1)
- 4-4.29 Discuss mechanisms of burn injury and conditions associated with an inhalation burn injury. (C-1)
- 4-4.30 Describe the management of an inhalation burn injury, including airway and ventilation, circulation, pharmacological, non-pharmacological, transport considerations, and psychological support/ communication strategies. (C-1)
- 4-4.31 Describe the epidemiology of a chemical burn injury and a chemical burn injury to the eye. (C-1)
- 4-4.32 Describe the specific anatomy and physiology pertinent to a chemical burn injury and a chemical burn injury to the eye. (C-1)
- 4-4.33 Describe the pathophysiology of a chemical burn injury, including types of chemicals and their burning processes and a chemical burn injury to the eye. (C-1)
- 4-4.34 Identify and describe the depth classifications of a chemical burn injury. (C-1)
- 4-4.35 Identify and describe the severity of a chemical burn injury. (C-1)
- 4-4.36 Describe considerations which impact management and prognosis of the patient with a chemical burn injury and a chemical burn injury to the eye. (C-1)
- 4-4.37 Discuss mechanisms of burn injury and conditions associated with a chemical burn injury. (C-1)
- 4-4.38 Describe the management of a chemical burn injury and a chemical burn injury to the eye, including airway and ventilation, circulation, pharmacological, non-pharmacological, transport considerations, and psychological support/ communication strategies. (C-1)
- 4-4.39 Describe the epidemiology of an electrical burn injury. (C-1)
- 4-4.40 Describe the specific anatomy and physiology pertinent to an electrical burn injury. (C-1)
- 4-4.41 Describe the pathophysiology of an electrical burn injury. (C-1)
- 4-4.42 Identify and describe the depth classifications of an electrical burn injury. (C-1)
- 4-4.43 Identify and describe the severity of an electrical burn injury. (C-1)
- 4-4.44 Describe considerations which impact management and prognosis of the patient with an electrical burn injury. (C-1)
- 4-4.45 Discuss mechanisms of burn injury and conditions associated with an electrical burn injury. (C-1)
- 4-4.46 Describe the management of an electrical burn injury, including airway and ventilation, circulation, pharmacological, non-pharmacological, transport considerations, and psychological support/ communication strategies. (C-1)
- 4-4.47 Describe the epidemiology of a radiation exposure. (C-1)
- 4-4.48 Describe the specific anatomy and physiology pertinent to a radiation exposure. (C-1)
- 4-4.49 Describe the pathophysiology of a radiation exposure, including the types and characteristics of ionizing radiation. (C-1)
- 4-4.50 Identify and describe the depth classifications of a radiation exposure. (C-1)
- 4-4.51 Identify and describe the severity of a radiation exposure. (C-1)
- 4-4.52 Describe considerations which impact management and prognosis of the patient with a radiation exposure. (C-1)
- 4-4.53 Discuss mechanisms of burn injury associated with a radiation exposure. (C-1)
- 4-4.54 Discuss conditions associated with a radiation exposure. (C-1)
- 4-4.55 Describe the management of a radiation exposure, including airway and ventilation, circulation, pharmacological, non-pharmacological, transport considerations, and psychological support/ communication strategies. (C-1)
- 4-4.56 Integrate pathophysiological principles to the assessment of a patient with a thermal burn injury. (C-3)
- 4-4.57 Integrate pathophysiological principles to the assessment of a patient with an inhalation burn injury. (C-3)
- 4-4.58 Integrate pathophysiological principles to the assessment of a patient with a chemical burn injury. (C-3)
- 4-4.59 Integrate pathophysiological principles to the assessment of a patient with an electrical burn injury. (C-3)

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4-4.84 Perform management of a radiation exposure, including airway and ventilation, circulation, pharmacological, non-pharmacological, transport considerations, psychological support/ communication strategies, and other management described by local protocol. (P-2)

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I. Introduction

- A. Epidemiology
 - 1. Incidence
 - a. Supportive statistics
 - 2. Mortality/ morbidity
 - a. Supportive statistics
 - 3. Risk factors
 - 4. Prevention strategies
 - B. Review the anatomy and physiology of the integumentary system
- II. General system pathophysiology, assessment and management
- A. Pathophysiology
 - 1. Pathophysiologic and systemic complications of a burn injury
 - a. Fluid loss
 - b. Electrolyte loss
 - c. Increased catecholamine release
 - d. Acidosis
 - e. Vasoconstriction
 - f. Renal failure
 - g. Liver failure
 - h. Heart failure
 - i. Hypoxia
 - j. Anoxia
 - k. Arrhythmias
 - l. Formation of eschar
 - m. Hypothermia
 - n. Hypovolemia
 - o. Infection
 - p. Complications of a circumferential burn
 - B. Assessment findings
 - 1. Types of burn injuries
 - a. Thermal burn
 - b. Inhalation burn
 - c. Chemical burn
 - d. Electrical burn
 - (1) Lightning
 - e. Radiation exposure
 - 2. Depth classification of a burn injury
 - a. Superficial burn
 - b. Partial-thickness burn
 - c. Full-thickness burn
 - d. Other depth classifications according to local protocol
 - 3. Methods for determining body surface area percentage of a burn injury
 - a. The "rule of nines"
 - (1) Adult

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- (2) Pediatric
- b. The "rule of palms"
 - c. Other methods according to local protocol
4. Severity of a burn
 - a. Minor burn
 - b. Moderate burn
 - c. Severe burn
 - d. Other severity classifications according to local protocol
5. Criteria for determining severity of a burn injury
 - a. The adult patient
 - b. The pediatric patient
 - (1) Special considerations
6. Considerations which impact management and prognosis of the burn injured patient
 - a. Age
 - b. Preexisting medical conditions
 - c. Trauma
7. Mechanisms of burn injuries
 - a. Burn trauma
 - b. Blast/ explosion trauma
 - c. Fall injury
 - d. Other injuries
8. Conditions associated with burn injuries
 - a. Trauma
 - (1) Soft tissue injuries
 - (2) Musculoskeletal injuries
 - b. Blast injuries
 - c. Airway compromise
 - d. Respiratory compromise
 - e. Child abuse
9. Signs and symptoms of burn injuries
 - a. Pain
 - b. Changes in skin condition relative to the affected burn site
 - c. Adventitious sounds
 - d. Sloughing of the affected skin
 - e. Hoarseness
 - f. Dysphagia
 - g. Dysphasia
 - h. Burnt hair
 - i. Nausea/ vomiting
 - j. Unconsciousness
 - k. Altered level of consciousness
 - l. Edema
 - m. Paresthesia
 - n. Hemorrhage
 - o. Other soft tissue injuries
 - p. Musculoskeletal injuries
 - q. Dyspnea

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- r. Chest pain
 - C. Management
 - 1. Airway, oxygenation, and ventilation
 - 2. Circulatory management
 - 3. Pharmacological support
 - a. Analgesia
 - 4. Non-pharmacological management
 - 5. Transport considerations
 - a. Appropriate mode
 - b. Appropriate facility
 - 6. Psychological support/ communication strategies
 - a. Patient and family advocacy
- III. Specific burn injuries
- A. Thermal burn injury
 - 1. Epidemiology of a thermal burn injury
 - a. Incidence
 - (1) Supportive statistics
 - b. Mortality/ morbidity
 - (1) Supportive statistics
 - c. Risk factors
 - d. Prevention strategies
 - 2. Review the specific anatomy and physiology pertinent to the integumentary system
 - 3. Review of heat energy and the components of the burning agent
 - 4. Pathophysiology of a thermal burn injury
 - a. The process of burn shock
 - (1) Emergent phase
 - (2) Fluid shift phase
 - (3) Hypermetabolic phase
 - (4) Resolution phase
 - b. Jackson's thermal wound theory
 - (1) Zone of coagulation
 - (2) Zone of stasis
 - (3) Zone of hyperemia
 - c. Inhalation injury (present in 60-70% of all burn patients who die)
 - (1) Carbon monoxide poisoning
 - (2) Cyanide intoxication
 - d. Infectious insult
 - e. Eschar formation
 - (1) Respiratory compromise secondary to circumferential eschar around the thorax
 - (2) Circulatory compromise secondary to circumferential eschar around an extremity
 - (3) Escharotomies
 - 5. Assessment findings in a thermal burn injury
 - a. Depth classifications of a thermal burn
 - b. Severity of a thermal burn

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- c. Criteria for determining severity of a burn injury
 - (1) The adult patient
 - (2) The pediatric patient
 - d. Considerations which impact care and prognosis of the thermal burn injured patient
 - e. Mechanisms of burn injury
 - (1) Scalding
 - (2) Steam
 - (3) Flame
 - (4) Flash
 - (5) Retained heat
 - (6) Other trauma
 - f. Conditions associated with thermal burn injuries
6. Management of a thermal burn injury
- a. Remove patient to safe area
 - b. Stop the burning process
 - c. Airway, oxygenation, and ventilation
 - d. Circulatory management
 - e. Pharmacological management
 - (1) Topical applications
 - (2) Tetanus and antibiotic therapy
 - (3) Fluid therapy
 - f. Non-pharmacological management
 - (1) Thermal burn injury management according to local protocol
 - g. Transport considerations
 - (1) Appropriate mode
 - (2) Appropriate facility
 - (3) Transport considerations in conjunction with burn injury management according to local protocol
 - h. Psychological support/ communication strategies
- B. Inhalation burn injury
- 1. Epidemiology of an inhalation burn injury
 - a. Incidence
 - (1) Supportive statistics (e.g., 20-35% of the patients admitted to burn centers have an inhalation injury)
 - (2) Chemical inhalation injuries are more frequent than thermal inhalation injuries
 - b. Mortality/ morbidity
 - (1) Supportive statistics
 - c. Risk factors
 - (1) Often associated with a burn environment
 - (2) Factors that increase the risk for inhalation injury
 - (a) Standing
 - (b) Screaming
 - (c) Enclosed area
 - d. Prevention strategies
 - 2. Review the specific anatomy and physiology pertinent to the respiratory system

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3. Pathophysiology of an inhalation injury
 - a. Compromises the upper airway (supraglottic)
 - b. Compromises the lower airway (infraglottic)
 - c. Complications may occur later
 4. Assessment findings in an inhalation injury
 - a. Mechanism of injury/ conditions associated with an inhalation burn injury
 - (1) Toxic inhalations
 - (2) Smoke inhalation
 - (3) Carbon monoxide poisoning
 - (4) Thiocyanate intoxication
 - (5) Thermal burn
 - (6) Chemical burn
 - b. Criteria for determining severity of a burn injury
 - (1) The adult patient
 - (2) The pediatric patient
 - c. Considerations which impact care and prognosis of an inhalation burn injured patient
 - d. Conditions associated with inhalation burn trauma
 - e. Focused history
 5. Management of an inhalation burn injury
 - a. Airway, oxygenation, and ventilation
 - b. Circulatory management
 - c. Pharmacological management
 - (1) Sodium thiosulfate therapy
 - d. Non-pharmacological management
 - (1) Thermal burn injury management according to local protocol
 - (2) Hyperbaric therapy - for carbon monoxide
 - e. Transport considerations
 - (1) Appropriate mode
 - (2) Appropriate facility
 - f. Psychological support/ communication strategies
- C. Chemical burn injury
1. Epidemiology of a chemical burn injury
 - a. Incidence
 - (1) Supportive statistics
 - b. Mortality/ morbidity
 - (1) Supportive statistics
 - c. Risk factors
 - d. Prevention strategies
 2. Anatomy and physiology review
 3. Pathophysiology
 - a. Types of chemicals which cause chemical burn injuries
 - (1) Acids
 - (2) Bases (alkali)
 - (a) Cement
 - (3) Dry chemicals
 - (4) Phenols

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- b. Characteristics of the burning process of chemicals
 - (1) The burning process of an acid
 - (2) The burning process of an alkali
 - (3) The burning process of dry chemicals
- 4. Assessment of a chemical burn injury
 - a. Mechanism of injury/ conditions for a chemical burn injury
 - (1) Industrial accidents most frequent
 - b. Depth classification
 - c. Severity
 - d. Criteria for determining severity of a burn injury
 - (1) The adult patient
 - (2) The pediatric patient
 - e. Considerations which impact care and prognosis of a chemical burn injured patient
- 5. Management of a chemical burn injury
 - a. Airway, oxygen, and ventilation
 - b. Circulatory management
 - c. Pharmacological management
 - d. Non-pharmacological management
 - (1) Acid burn injury management according to local protocol
 - (2) Alkali burn injury management according to local protocol
 - (3) Chemical burn injury to the eye according to local protocol
 - (4) Dry chemical burn injury according to local protocol
 - e. Transport considerations
 - (1) Appropriate mode
 - (2) Appropriate facility
 - f. Psychological support/ communication strategies
- D. Chemical burn injury of the eye
 - 1. Epidemiology of a chemical burn injury
 - a. Incidence
 - (1) Supportive statistics
 - b. Mortality/ morbidity
 - (1) Supportive statistics
 - c. Risk factors
 - d. Prevention strategies
 - 2. Anatomy and physiology review of the eye
 - 3. Pathophysiology
 - a. Types of chemicals which cause chemical burn injuries to the eye
 - (1) Acids
 - (2) Bases (alkali)
 - (a) Cement
 - (3) Dry chemicals
 - (4) Phenols
 - (5) Mace/ pepper spray
 - 4. Assessment of a chemical burn injury
 - a. Mechanism of injury/ conditions for a chemical burn injury
 - (1) Industrial accidents most frequent

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- b. Severity
 - c. Criteria for determining severity of a eye injury
 - d. Considerations which impact care and prognosis of a chemical injury to the eye
 - 5. Management of a chemical burn injury of the eye
 - a. Airway, oxygenation, and ventilation
 - b. Circulation management
 - c. Pharmacological management
 - d. Non-pharmacological management
 - e. Transport considerations
 - (1) Appropriate mode
 - (2) Appropriate facility
 - f. Psychological support/ communication strategies
- E. Electrical burn injuries
- 1. Epidemiology of an electrical burn injury
 - a. Incidence
 - (1) Supportive statistics
 - b. Mortality/ morbidity
 - (1) Supportive statistics
 - c. Risk factors
 - d. Prevention strategies
 - 2. Anatomy and physiology review
 - 3. Review of the characteristics of electrical current
 - 4. Pathophysiology
 - a. External burn injuries
 - b. Internal burn injuries
 - c. Musculoskeletal injuries
 - d. Cardiovascular injuries
 - e. Respiratory injuries
 - f. Neurological injuries
 - g. Myoglobin release and renal involvement
 - 5. Assessment of an electrical burn injury
 - a. Mechanism of injury/ conditions for an electrical burn injury
 - (1) Contact burn injuries
 - (2) Arc injuries
 - (3) Flame or flash burn injuries
 - (a) Welder's flash
 - (4) Lightning injuries
 - (a) Direct stroke
 - (b) Side flash (splash)
 - (c) Step voltage
 - b. Depth classification
 - c. Severity
 - d. Criteria for determining severity of an electrical burn injury
 - (1) The adult patient
 - (2) The pediatric patient
 - e. Considerations which impact care and prognosis of an electrical burn injured patient

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6. Management of an electrical burn injury
 - a. Airway, oxygenation, and ventilation
 - b. Circulation management
 - c. Pharmacological management
 - d. Non-pharmacological management
 - (1) Thermal burn injury management according to local protocol
 - e. Transport considerations
 - (1) Appropriate mode
 - (2) Appropriate facility
 - f. Psychological support/ communication strategies
- F. Radiation exposure
 1. Epidemiology of a radiation exposure
 - a. Incidence
 - (1) Supportive statistics
 - b. Mortality/ morbidity
 - (1) Supportive statistics
 - c. Risk factors
 - (1) Accidents associated with the improper handling of radiological materials
 - d. Prevention strategies
 2. Anatomy and physiology review
 3. Types of radiation which cause burn injury
 - a. Alpha radiation
 - b. Beta radiation
 - c. Gamma radiation
 4. Characteristics of ionizing radiation
 - a. Alpha radiation
 - b. Beta radiation
 - c. Gamma radiation
 5. Aspects of exposure
 - a. Duration of exposure
 - b. Distance from the source
 - c. Shielding
 6. Other considerations of exposure
 - a. Direct exposure to ionizing radiation
 - b. Exposure to contaminants containing small particles of active material
 7. Assessment of a radiation exposure
 - a. Mechanism of injury
 - b. Depth classifications
 - (1) Immediate versus delayed injuries and affects
 - c. Severity
 - (1) Immediate versus delayed injuries and affects
 - d. Criteria for determining severity of a radiation exposure and associated burn injury
 - (1) The adult patient
 - (2) The pediatric patient
 - e. Considerations which impact care and prognosis of a radiation exposure and

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- burn injuries
- 8. Management of a radiation exposure and associated burn injuries
 - a. Scene safety
 - b. Airway, oxygenation, and ventilation
 - c. Circulation management
 - d. Pharmacological management
 - e. Non-pharmacological management
 - (1) Injury management according to local protocol
 - (2) Management of a radiation accident scene
 - f. Transport considerations
 - (1) Appropriate mode
 - (2) Appropriate facility
 - g. Psychological support/ communication strategies

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